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- AUSTRIA -

by K. Iledersteger

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/Following is a translation of an article by K. Ledersteger in the German-language periodical Oesterreichische Zeitschrift fur Vermessungswesen (Austrian Journal of Geodesy), Baden (Vienna), Vol. XLVII, No. 5/6, December 1959, page 148-152/

In April of this year the Reverend Professor Dr P. S. Sakatow, rector of the School for Geodetic Engineering in Moscow, invited me to make a voyage of 14 days to lecture in Moscow and Leningrad. This trip gave me, among many other things, a deep and very interesting survey of the geodetical life in this enormous country. Before embarking here on informing my Austrian fellow geodesists about the most important things, I must first remark that the special circumstances concerning geodetics in this Soviet country which covers nearly a continent, are so principally different from those in our small country, that we should be very humble even when we do not consider these circumstances. But even when we do not consider the natural circumstances, that are the same for many sciences, the remarkably intensive scientific life in the Soviet Union, most of it /directed/ by the government, is an experience for the foreign vistor that gives rise to comparisons from many points of view.

The special school that I mentioned before, The Institute for Geodetic, Aerophotogrammetric and Cartographic Engineering in Moscow--abbreviated MIIGAiK has now about 2000 students and four faculties: a mechanical-optical faculty, where instrument constructors are educated; a geodetical faculty which is split in the higher semesters into a division of geodetical engineering and one for astronomical geodesy; and a faculty for photogrammetry and cartography. There are 23 chairs, with 40 teaching professors and 50 teachers (Dr.-Eng.), helped by 70 assistants. Every chair has, except for its chairman, several normal professors, depending on its importance and size; they have no what we call extraordinary Professors. The study course takes ten semesters, including practical work of at least twelve weeks at the government department for measurements, but we must understand that the students generally come a year earlier from high school than they do here. The great neef for specialists in the several divisions and the great number of students expedites far-reaching and efficient classification in the education for science and experimental geodetics. This does not mean at all that only one-sided specialists are created. In the

contrary! Not only in geodetics but also in all the sciences a deep and broad knowledge is considered very valuable. In the special school for geodetics this of course involves a very thorough knowledge of the mathematical and physical subjects and the intensive study of languages. Nowadays English is gradually becoming more important than German which was previously more essential. Mathematical studies are distributed over six semesters, while the last semester devoted to special courses in differential equations, differential geometry, variation calculus and spherical functions. The education in physics require five semesters, with theoretical mechanics as a major, reaching up to modern radar methods and the electro-optical measurement of distances.

Because I needed so much time for the visits to similar institutes, I could only deepen my knowledge about the geodetic-astronomic department. The numbers that I shall mention give immediate conclusions. Higher geodetics is taught in five semesters, both physical geodetics and determination of coordinates in astronomy in three semesters and geophysics in two semesters. The theoretical teaching is complemented by a very extensive practical knowledge, where practice in the institute preceedes field practice, Field practice consists of 33 weeks in the summer month, distributed as follows: 16 weeks-low geodetics, five weeks-higher geodetics, seven weeks-astronomy, two weeks-gravimetry, two weeks-photogrammetry, and one week-geomorphology. During these practical exercises the students live in their own buildings in the wide fields where they practice near the Moscow-Kursk railway, or just in tents, which are later often necessary.

Detailed data about the program of the exercises of the astronomic-geodetic department can be obtained from an article from the Czech engineer, M. Bursa, who studied in Moscow and wrote about it in a periodical of this field of Prague. I am very glad that H. Kasper: /See Note/ has translated this interesting article in German. From this article we take the following examples from the program of the exercises: /H. Kasper: "The study of geodetics in the Soviet Union", Switzerland, Journal of Geodetics, 1958, page 89-92./

1. Lower Geodetics II: I-2 days checking instruments, 3 .5km. polygonal measurement, 3 km. nivellation 3.0., 3-4 days measurements of distances, 10 km. barometric nivellation, 10 km^2. topographical mapping I:25,000 and working up the data.

2. Higher Geodetics: a) Three weeks triangulating I.-2.0., Day and night observations for the measurement of angles in all combinations, direction observations in the 2.0., Calibration of the micrometer, determination of the run, measurement of the zenith distance, local single measurements, working with heliotrope and reflector, recognizing, projection of height, b) Measurement of the base: one km., with four wires and calibration of the wires. c) Accurate nivellation: 3-4km., calibration and check of the equipment.

3. Experimental Astronomy: measurement of azimuth and latitude with the polaris, Measurement of azimuth according to Krassowskij, Azimuth Latitude and correction of the time with observations of the sun, evaluation of the time according to Zinger, measurement of latitude according to Piewzow, Azimuth Polaris I. O., measurement of latitude according to Talcott, measurement of longitude I. O., measurements of corresponding height, measurements and determination of constants with the meridian refractor.

The exercises in the laboratory are also very good. The students are taught, for example, the relative measurement of gravitation with the pendulum apparatus of Sterneck and with gravitation meters (generally type Norgaard). There is certainly a sort of national pride: in the program of exercises in astronomy the specific Russian methods are favoured.

Of course such a broad and thorough theoretical and practical education is only possible when we have the division in faculties that I mentioned before. In our schools however, the student must get a survey over the total field of geodetics, which is only possible when the amount of knowledge is limited: the specializes knowledge must be learned during the experiments. Here, in the new method of studying, the distribution of the subject matter demands close attention. In my opinion the higher branches should be favoured here, although they are less often used in the work of the engineer. But the deep knowledge of the easy methods can be learned relatively easily in practice, while a thorough knowledge of the higher branches of science makes it possible for the engineer to understand and follow the literature with pleasure and to expand his knowledge in that way. Just the Russian example should make us think. How else could we exist honourably in the scientific field besides the giants America and Russia, but also besides our European neighbours?

Just during my lectures these thoughts occured to me. I was surprised at the great interest of the auditors for the certainly difficult problem of the shape of the earth and about the earnest arguments in the discussion of many auditors, who clearly showed a thorough knowledge of the subject. This lively following, this mental fight, if I may call it so, has made me very glad and will be a pleasant memory. I was also very surprised at the astonishing staying-power of my auditors. In my first lecture about the teaching of geodetics and the organization of the geodetical service of the government in Austria, I tried, as I am doing here, to ask the attention of the auditors for not more then one hour. They were, however, clearly disappointed and disapproved of it for being an "unusually short lecture". My lecture about my own subject, however, took nearly four hours and would have taken even longer if the leader of the discussion, Prof. Dr. Isotow, had not stopped me during my answer period because he wanted me to do still other things during the evening.

The capacity for enthusiasm can be seen clearly from great lack of space. Nonetheless the lecture room where Pro. Krassowskij held his lectures for many years is held in great honour, and the room of his successor looks more like a little museum then the working room of scientist.

Besides enthusiasm for discussions that I mentioned before, the most striking qualities of the Russian intellectuals are an unquenchable thirst for science, toughness and staying-power: a student, who often worked as a translator during my stay, appeared one morning at seven o'clock in the lounge of the hotel, although she had been up until four o'clock in the morning observing at the meridian refractor. A motive for this great diligence of the students is without doubt the astonishing requirements for students, and specially the talent requirements. About 80% of all students, among whom there are to my surprise, more than 50% girls, receive stipends, between 300 roubles during the first semester and 600 rouble for those who are graduated. Because the award of the stipends depends, of course, on the result of the study, and because the examinations are very difficult, the students work about twelve hours a day.

Some comparison of salary would be interesting lever. A professor receives 5000 roubles a month (this is not increased every two years, as in our country); a chairman of a faculty receives 500 roubles more. Besides this, a field member of the Soviet Academy of Sciences receives an additional 5000 roubles a month, a corresponding member 3000 roubles. All scientific work is very well paid. At the same time, the rigid scientifical books are extremely cheap. For example: I could buy a book of about 200 pages about rockets and sputniks with very solid articles, for three roubles, which is, according to the real value of the money, about three Shillings.

The generally recognized enormous results that are nowadays achieved in all fields of science and all technique are not only achieved because of the great diligence of the Russian scientists, who are at the same time very kindhearted, and their famous great mathematical talents, but also because of their cooperation, which is obviously consciously directed. Here we will give also some highlights. In the new University of Moscow, a huge building in the so-called Russian Gothic style with 31 floors, I was the guest of the chairman of the geographical faculty, which has nowadays 900 students, who are, the chairman told me, not studying to teach geography in high schools, but nearly always to help open the country for commerce and industry. This faculty has developed in four years a museum of natural sciences of a really astonishing quality that is distributed over seven floors. Another example: the famous astronomical observatory of Pulkovo that was completely ruined during the war has been rebuilt and gives now work to 200 professional astronomers for observations. Less then 25 km. away from Leningrad is the Institute for Theoretical Astronomy of the Soviet Academy of Sciences, where about

250 people are working, among them many first-rank scientists. How would it be possible to compete with such an effort? Besides, on the other side of the Urals, in Novosibirsk, a new city has come into existence within a few years, which will probably soon be an intellectual center of the first order.

Now something more about the organization of the geodetic department of the government, which is, however, astonishing uncomplicated because there is no land registry as all the land is government owned. At the head of the department of geodetics of the government is the head department, which is directly under the Minister of Home Affairs. The work of the head department is, just like the work of our department of weights and measures and geodetics:

1. Triangulation 1.-3.0. (length of the sides 6-7 km.);
2. Astronomical work 1.0. (Laplace-Points);
3. Measurements of base;
4. Nivellement 1.-3.0. (3.0. = network);
5. Topographical mapping 1:50,000, 1:25,000, 1:10,000, for town plans, power-stations and regulation of rivers a.?.o. Also 1:5000 and 1:2000, the last ones with a denser pattern of triangles.
6. Map making (in Moscow, Leningrad, Minsk, Novosibirsk and other towns;
7. Air photos, together with the head department for civil air traffic. So-called factories of the head department are in several parts of the Soviet Union, for example: Moscow, Kiev, Tiflis, Novosibirsk, Tashkent and other towns. These factories are partly owned by the Union, partly by the Republics, and have the same work as the head department. They are not subordinate to the head department, although this has a certain right of control.

Several smaller measurements, for example small triangulations for special industrial or economical purposes (receiving networks) are done by certain other organizations, specially geological and geophysical ones. The military measurements are rigidly separated from the civil ones. The Ministry of Agriculture has a special department of land registry. It is of subordinate importance, because the land is government owned. All the same, tax must be paid for the land on which, for example, a house has been built. For a surface of about 2000 m^2 this is about 200 rouble per year.

I could relate very many other things that are interesting to geodesists, for example, about the absolute measurements of weight in the famous Mendelejev Institute in Leningrad and about the Geophysical Institute of Professor Boulanger in Moscow, where a new ocean gravimeter (Seagrvimeter) is prepared for the first test trials in the summer, or about the Institute of Theoretical Astronomy in Leningrad, whose vice-rector, Professor Schlongolowitsch is a well-known specialist in the science of the earth. But purely scientifical questions would be outside the theme of this publication.

I must conclude that I have gained very much by this voyage, not only because of the exchange of scientific ideas with the leading Russian geodesists but also because of the great and unique experiences of Moscow and Leningrad, two towns of completely different charm, who are already for many centuries ganglions of world history.

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